

Posttraumatic Stress Disorder, Anger, and Partner Abuse Among Vietnam Combat Veterans

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The authors examined interrelationships among posttraumatic stress disorder (PTSD) symptomatology, anger, and partner abuse perpetration among a sample of 60 combat veterans. Compared with PTSD-negative participants, PTSD-positive participants reported higher state anger across time and neutral and trauma prime conditions and higher anger reactivity during the trauma prime condition. PTSD-positive participants also exhibited more anger reactivity during the trauma prime than during the neutral condition. The same pattern of results was not found for anxiety reactivity during trauma memory activation. PTSD symptoms were associated with physical assault and psychological aggression perpetration, and trait anger mediated these relationships. Findings indicate a heightened anger response among PTSD-positive veterans and suggest the salience of dispositional components of anger in abuse perpetration in this population.

Keywords: posttraumatic stress disorder, anger, partner abuse, domestic violence, psychological aggression

Military veterans often report anger as their most salient problem (Blum, Kelley, Meyer, Carlson, & Hodson, 1984), and there is evidence of a link between posttraumatic stress disorder (PTSD) symptomatology and self-reported anger among veterans (Chemtob, Hamada, Roitblat, & Muraoka, 1994). However, relatively little is known about the anger response among veterans with PTSD, particularly when confronted with cues for their traumatic memories. Further, no research has been conducted among combat veterans to examine the possible effects of anger on outcomes such as

aggression and relationship abuse. Given the considerable evidence indicating that male veterans experiencing PTSD symptomatology are at risk for partner abuse perpetration (Byrne & Riggs, 1996; Jordan et al., 1992) and research suggesting distinct etiological factors for abuse perpetration among this population (e.g., Taft et al., 2005), we undertook this study to better understand the interrelationships among PTSD symptomatology, anger, and abuse perpetration in a sample of combat veterans.

Chemtob and colleagues (Chemtob, Novaco, Hamada, Gross, & Smith, 1997) developed an information-processing-based model for PTSD and associated outcomes. This model holds that combat veterans with PTSD, by virtue of their prior experience of life threat, are more likely to perceive threats in their environment, even in the absence of realistic threat. In response to these perceived threats, the veteran enters into a “survival mode,” characterized by heightened arousal and several cognitive biases, including a hostile appraisal of events, an inclination toward threat confirmation, increased vigilance in recognizing a threat, and a lower threshold for responding to the threat. These processes negatively impact the veteran’s ability to regulate anger and engage in self-monitoring behaviors or other inhibitory processes, resulting in an increased propensity toward aggression.

Consistent with this model, trauma cues should lead to heightened anger among combat veterans with PTSD symptoms, and this anger should be associated with aggression.

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This research was supported by a Department of Veterans Affairs Merit Review Grant awarded to David S. Riggs.

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Others have similarly argued that one of the mechanisms contributing to the pathological manifestation of anger among traumatized individuals is the repeated activation of trauma memories (Riggs, Dancu, Gershuny, Greenberg, & Foa, 1992). One study of combat veterans found large, significant differences between those with and without PTSD on a single-item anger rating obtained immediately following trauma script presentation (Pitman, Orr, Forgue, de Jong, & Claiborn, 1987). Among the PTSD group, anger was endorsed at higher rates than all of the other affective response options, including fear, sadness, surprise, disgust, and happiness. In the current study, we build on these findings using a validated state anger measure, comparing anger and anxiety following a trauma prime, comparing responses to trauma and neutral primes, and examining associations between levels of state anger and anger reactivity during trauma memory activation with measures of aggressive behavior outside the laboratory.

Holtzworth-Munroe's (1992) application of McFall's (1982) social-information-processing model to relationship abuse posits that anger interferes with rational cognitive processing, resulting in skills deficits that lead to a higher likelihood of abuse. Supporting this model, as well as Chemtob, Novaco, Hamada, Gross, & Smith's (1997) information-processing model, Eckhardt and colleagues (e.g., Eckhardt, Barbour, & Davison, 1998) have consistently found that during anger induction procedures, civilian men who have committed violence against their partners exhibit elevated irrational thoughts and cognitive biases. Moreover, civilian sample studies have documented associations between uncued anger measures and perpetration of relationship abuse, although some contrary findings have been reported (see Norlander & Eckhardt, 2005). Therefore, given links between PTSD and anger and between anger and abuse, it is plausible that anger would mediate the impact of PTSD symptoms on abuse among veterans.

The current investigation tested the following hypotheses: (a) Veterans with PTSD would report higher state anger than veterans without PTSD before exposure to both trauma and neutral priming stimuli and a greater increase in state anger (i.e., anger reactivity) following exposure to a trauma prime; (b) among PTSD-positive participants, anger reactivity would be greater than anxiety reactivity following exposure to a trauma prime; (c) among PTSD-positive individuals, anger reactivity would be greater in response to a trauma prime than to a neutral prime; (d) PTSD symptoms would be associated with perpetration of physical and psychological aggression; and (e) state anger after exposure to a trauma prime, anger reactivity during exposure to a trauma prime, and self-reported trait anger would mediate associations between PTSD symptoms and relationship abuse.

Method

Participants

Participants were 60 male combat veterans who had served in the Vietnam theater of operations between 1964 and 1973. To be included in this study, all participants must have been in a romantic heterosexual relationship for at least 1 year. Veterans were re-

cruited from 1997 to 1998 using newspaper ads and flyers placed in a Department of Veterans Affairs Medical Center in a large northeastern city. No significant differences were found between PTSD-positive ($n = 18$) and PTSD-negative ($n = 42$) participants on any of the demographic variables. For PTSD-positive participants, the average age was 50.51 ($SD = 3.45$); the average age of the PTSD-negative participants was 52.14 ($SD = 5.33$). Most of both PTSD-positive (83.3%) and PTSD-negative (88.1%) participants were White. Half of those with PTSD (50.0%) reported annual incomes of less than \$20,000, with approximately 33.3% of those without PTSD falling within this income range, and PTSD severity and income level (including wage and nonwage income) were not significantly correlated ($r = -.17$, ns). All PTSD-positive participants and 95.2% of PTSD-negative participants reported attaining at least a high school education. As expected, the PTSD-positive group ($M = 30.78$, $SD = 8.01$) reported higher levels of combat exposure on the Combat Exposure Scale (Keane et al., 1989) than did the PTSD-negative group ($M = 21.64$, $SD = 10.84$), $t(58) = -3.21$, $p < .01$, $r = .39$.

Measures

The Cue Reaction Questionnaire (CRQ) is an 11-item measure designed for the present study to assess the effectiveness of the priming stimulus application. The measure assesses state-level cognitions and emotions that are potentially affected by exposure to trauma cues (e.g., "Pictures or thoughts about Vietnam are in my mind," and "I am distressed and upset"). Participants indicated the extent to which each item described their current thoughts and feelings. The CRQ was administered before and after both the neutral and trauma primes. Internal consistency estimates across administrations ranged from .94 to .96. Additionally, analyses conducted on data obtained prior to the priming stimulus presentation at each session indicated that the CRQ total scale score was reliable over a period of 1 week, $r(59) = .92$, $p < .001$.

The Clinician Administered PTSD Scale (CAPS; Blake et al., 1990) was used to assess the presence of PTSD and the severity of PTSD symptoms. The CAPS is a widely used semistructured diagnostic interview that has also been commonly used to derive a continuous measure of PTSD symptomatology (see Weathers, Keane, & Davidson, 2001). Interviewers assign frequency and intensity scores for each of the 17 symptoms on a 5-point Likert scale based on client's experience during the previous month, and a total severity score for each symptom is computed by summing the frequency and intensity scores. A PTSD diagnosis is conferred if at least one reexperiencing symptom, three avoidance and numbing symptoms, and two hyperarousal symptoms reach symptom status (i.e., endorsement of ≥ 1 on frequency and ≥ 2 on intensity). The CAPS has been shown to have high interrater reliability, internal consistency, and concurrent validity with other measures of PTSD (Blake et al., 1995). In the initial test of interrater reliability for the CAPS, among a sample of Vietnam combat veterans similar to those of the current study, Blake et al. (1990) found frequency and intensity scores across the three symptom clusters to range from .92 to .99, with perfect diagnostic agreement across participants. For the current investigation, the CAPS interviews were administered by two doctoral-level clinicians and one master's-level clinician, all of whom had extensive experience in the assessment and treatment of veterans with PTSD. All interviewers had been trained to reliability by the creators of the instrument, and all had at least 6 months' experience using the CAPS under supervision before conducting interviews for this study. Mean CAPS scores ($M = 33.19$, $SD = 34.49$) fell within the subthreshold/mild PTSD range (Weathers et al., 2001), with a score of 77.39 ($SD = 20.20$) for PTSD-positive participants and 13.78 ($SD = 16.90$) for PTSD-negative participants.

The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1988) was used to assess anger. The 10-item Trait Anger scale measures individual differences in the disposition to experience anger (e.g., "hotheaded"). Average Trait Anger scale scores in the current sample were 19.33 ($SD = 6.94$), with PTSD-positive participants reporting significantly more trait anger ($M = 24.39$, $SD = 8.29$) than PTSD-negative participants ($M = 17.17$, $SD = 4.98$), $t(58) = -4.18$, $p < .01$, $r = .48$. The 10-item State Anger scale is a measure of the intensity of angry feelings at a particular time (e.g., "irritated") and was administered before and after the presentation of the priming stimuli. The STAXI has been found to have strong reliability and validity (Spielberger, 1988). For the Trait Anger scale, the internal consistency reliability estimate in the current sample was .93. Alpha coefficients across the four administrations of the State Anger scale ranged from .92 to .96.

The Beck Anxiety Inventory (BAI; Beck & Steer, 1990) was administered before and after the presentation of the priming stimuli to measure general affective and anxious arousal. Psychometric studies support the use of the BAI as a measure of state anxiety (Creamer, Foran, & Bell, 1995; Osman, Kopper, Barrios, Osman, & Wade, 1997). This 21-item measure includes 15 items referencing physical symptoms (e.g., pounding or racing of the heart) and 6 items referencing cognitive symptoms (e.g., feeling terrified) of anxiety. Instructions asked participants to measure their current anxiety on a scale ranging from 0 (*not at all*) to 3 (*severely*), and these scores were summed. The BAI has been shown to have good internal consistency and test-retest reliability and strong concurrent and discriminant validity (Beck & Steer, 1990). In the current sample, internal consistency estimates ranged from .94 to .96 across the four administrations of the BAI.

The Conflict Tactics Scale (CTS; Straus, 1979) is a 19-item self-report questionnaire that was used to assess participants' perpetration of aggression toward their intimate female partners. The current investigation used the 9-item Physical Assault (e.g., "Have you kicked, bit, or hit your partner with a fist?") and 7-item Psychological Aggression (e.g., "Have you done or said something to spite your partner?") CTS subscales. Participants indicated the frequency with which they had perpetrated each behavior during their current intimate relationship on a 7-point response scale ranging from 0 (*never*) to 6 (*more than 20 times*). These items were summed to estimate overall frequency of abuse, with average Physical Assault and Psychological Aggression subscale scores of 1.73 ($SD = 4.09$) and 9.74 ($SD = 8.20$), respectively. The internal consistency reliability estimate was .80 for the Physical Assault subscale in the current sample and .79 for the Psychological Aggression subscale. Approximately 40% of veterans in this study endorsed at least one act of physical assault during their current relationship, and 91% endorsed at least one act of psychological aggression. Compared with PTSD-negative participants, PTSD-positive participants scored significantly higher on the Physical Assault, $M = 5.19$, $SD = 7.81$ versus $M = .62$, $SD = 1.70$, $t(56) = -4.93$, $p < .01$, $r = .26$, and Psychological Aggression, $M = 19.12$, $SD = 10.42$ versus $M = 8.36$, $SD = 6.14$, $t(57) = -3.63$, $p < .01$, $r = .41$, subscales. Physical Assault scores were log-transformed to reduce skewness for all subsequent analyses.

Procedure

Participants attended three consecutive weekly sessions. During the first session, participants provided informed consent, completed the diagnostic interview and a battery of self-report instruments, and were introduced to the testing room for a 10-min resting period for the purposes of adaptation to the testing environment. During the latter two sessions, participants initially completed a brief series of questionnaires related to their current

emotional state and then were presented with a 10-min auditory priming stimulus. In one session, participants were presented with a neutral prime, which consisted of 10 min of medium tempo, semiclassical music. In the other session, participants were presented with a trauma prime, which consisted of 10 min of combat-related sounds, including helicopters, gunfire, and Vietnamese voices. Recorded instructions informed the participants whether they would be listening to music sounds or combat sounds. The order of the priming conditions were counterbalanced across participants, and the testing sessions were separated by a minimum period of 1 week to reduce carryover effects. After the presentation of the priming stimulus, participants again completed questionnaires assessing their emotional state. Similar affective and neutral manipulations have been used successfully in previous research with Vietnam combat veterans (Keane et al., 1998; Litz, Orsillo, Kaloupek, & Weathers, 2000). All participants were asked to refrain from alcohol or drug use for 24 hr prior to their participation in each session. All procedures for this study received approval from the hospital's institutional review board.

Analyses

First, the effectiveness of the priming stimuli was examined by comparing preprime to postprime changes on the CRQ between the two priming conditions. Next, two separate three-way (Group \times Condition \times Time) repeated measures analyses of variance (ANOVA) were conducted to determine whether, compared with PTSD-negative veterans, PTSD-positive veterans would evidence higher preprime state anger and a greater increase in state anger (i.e., anger reactivity) on trauma memory activation. Group was a between-subjects variable with two levels (PTSD-positive and PTSD-negative), condition was a within-subjects variable with two levels (trauma prime and neutral prime), and time was a within-subjects variable with two levels (premanipulation and postmanipulation). The time variable measured state anger responses pre- and postmanipulation in the first repeated measures ANOVA and measured anxiety responses pre- and postmanipulation in the second repeated measures ANOVA. As necessary, statistically significant interaction effects were probed using more specific repeated measures ANOVA analyses.

The approach to testing mediators outlined by MacKinnon and Dwyer (1993) and based on the work of Baron and Kenny (1986) was used to test hypotheses positing that post-trauma prime state anger and anger reactivity during trauma memory activation, as well as the trait anger measure, would mediate associations between PTSD symptoms and the relationship abuse outcomes. The mediational hypothesis would be supported if (a) PTSD symptoms were associated with relationship abuse, (b) PTSD symptoms were associated with the anger measure, (c) the effects of anger were significant when PTSD symptoms and the anger measure were entered together into a regression predicting abuse, and (d) the mediation effect was significant. A total of six mediational analyses were possible, corresponding with the three potential mediators (post-trauma prime state anger, anger reactivity, and trait anger) and the two relationship abuse outcomes (physical assault and psychological aggression). Effect sizes were interpreted in terms of suggestions made by Cohen (1988).

Results

Manipulation Checks of Trauma Memory Activation

CRQ change scores (i.e., preprime scores subtracted from postprime scores) indicated that there was a greater increase in traumatic memories and emotions under the trauma prime

Table 1
Means and Standard Deviations of Anger and Anxiety Scores According to Condition, Time, and Group

Variable	Group	Neutral prime condition				Trauma prime condition			
		Premanipulation		Postmanipulation		Premanipulation		Postmanipulation	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
STAXI State Anger scale	PTSD-positive	15.76	8.11	15.18	7.41	13.11	4.99	14.78	5.46
	PTSD-negative	10.69	1.65	10.59	1.63	10.81	1.93	11.05	2.57
Beck Anxiety Inventory	PTSD-positive	16.06	13.56	10.91	11.25	12.72	13.05	12.22	11.98
	PTSD-negative	4.03	5.96	2.60	5.60	4.17	8.39	3.73	7.58

Note. STAXI = State-Trait Anger Expression Inventory; PTSD = posttraumatic stress disorder.

condition (mean change = 6.60) than under the neutral condition (mean change = -1.70), $t(57) = 8.46$, $p < .001$, $r = .22$. Further, examination of correlations within each condition revealed that PTSD symptoms were associated with an increase in trauma-related memories and emotions under the trauma prime condition, $r = .25$, $p < .05$, and with a decrease in trauma-related memories and emotions under the neutral condition, $r = -.37$, $p < .01$. Thus, the trauma memory activation procedures appeared to be effective.

Repeated Measures Analyses

Table 1 lists the means and standard deviations for both the state anger and anxiety scores across group (PTSD-positive and PTSD-negative) and according to condition (neutral prime and trauma prime) and time (pre- and post-manipulation). The three-way (Group \times Condition \times Time) repeated measures ANOVA performed on participants' state anger scores revealed a main effect of group, $F(1, 56) = 15.43$, $p < .001$, $r = .46$, indicating that across conditions and time, the PTSD-positive group evidenced higher state anger scores than the PTSD-negative group. In addition, a significant Condition \times Time interaction emerged, $F(1, 56) = 14.65$, $p < .001$, $r = .46$, as well as a significant Group \times Condition \times Time interaction, $F(1, 56) = 7.70$, $p < .01$, $r = .35$. Decomposition of the three-way interaction revealed a significant effect of time for the PTSD-positive group within the trauma prime condition, $F(1, 17) = 17.71$, $p < .001$, $r = .71$, indicating that state anger increased significantly following the trauma prime among the PTSD-positive group. In contrast, the remaining effects of time within each group and condition were not significant (i.e., the effects of time for the PTSD-positive group in the neutral prime condition, $F(1, 16) = .80$, ns , $r = .22$; the PTSD-negative group in the neutral prime condition, $F(1, 40) = .53$, ns , $r = .11$; and the PTSD-negative group in the trauma prime condition, $F(1, 41) = .89$, ns , $r = .15$, were not significant). Figure 1 illustrates the patterns of means for the Group \times Condition \times Time interaction.

The three-way (Group \times Condition \times Time) repeated measures ANOVA performed on participants' anxiety scores revealed a main effect of group, $F(1, 55) = 14.98$, $p < .001$, $r = .47$, indicating that across conditions and

time, PTSD-positive participants reported experiencing higher levels of anxiety than PTSD-negative participants did. A main effect of time was also revealed, $F(1, 55) = 9.81$, $p < .01$, $r = .40$, indicating that, across groups and conditions, anxiety decreased significantly postmanipulation. A significant Condition \times Time interaction also emerged, $F(1, 55) = 6.50$, $p < .05$, $r = .33$, indicating that anxiety decreased more during the neutral prime condition than during the trauma prime condition, thus verifying the validity of the two condition manipulations.¹ Because the three-way interaction was nonsignificant, these results suggest that the groups differed more in anger than in anxiety reactivity on trauma memory activation. Given the high intercorrelation between state anger and anxiety scores (i.e.,

¹ Given concerns regarding the possible impact of the relationship (albeit nonsignificant) between income and PTSD symptoms on the pattern of findings, we conducted a series of exploratory analyses. Separately for participants' state anger and anxiety scores, we conducted two Group \times Condition \times Time repeated measures ANCOVAs including participants' income level as a covariate, two Group \times Condition \times Time repeated measures ANOVAs with group representing participants' high versus low income level, and two Group \times Condition \times Time repeated measures ANCOVAs with group representing participants' income level and including participants' PTSD symptoms as a covariate. For participants' anger scores, the significant Group \times Condition \times Time interaction remained when we controlled for the effect of income, $F(1, 55) = 6.63$, $p < .01$, $r = .33$, and this interaction continued to represent the significant effect of time for the PTSD-positive group within the trauma prime condition, $F(1, 16) = 10.62$, $p < .01$, $r = .63$. Although the same pattern of results emerged when income level was used as the grouping variable, this result did not emerge when income level was the grouping variable and PTSD symptoms were used as a covariate. For participants' anxiety scores, when we used participants' income level as a covariate, a three-way Group \times Condition \times Time interaction emerged, $F(1, 54) = 4.16$, $p < .05$, $r = .27$. Decomposition of this interaction revealed an effect of time for the PTSD-positive group during the neutral condition when we controlled for the effect of income, $F(1, 15) = 5.37$, $p < .05$, $r = .51$, indicating that anxiety decreased significantly over time for this group. When we included participants' income level as the grouping variable and when we used PTSD symptoms as a covariate, a Group \times Condition \times Time interaction did not emerge. Together, these results suggest that income is not a significant confound to our results.

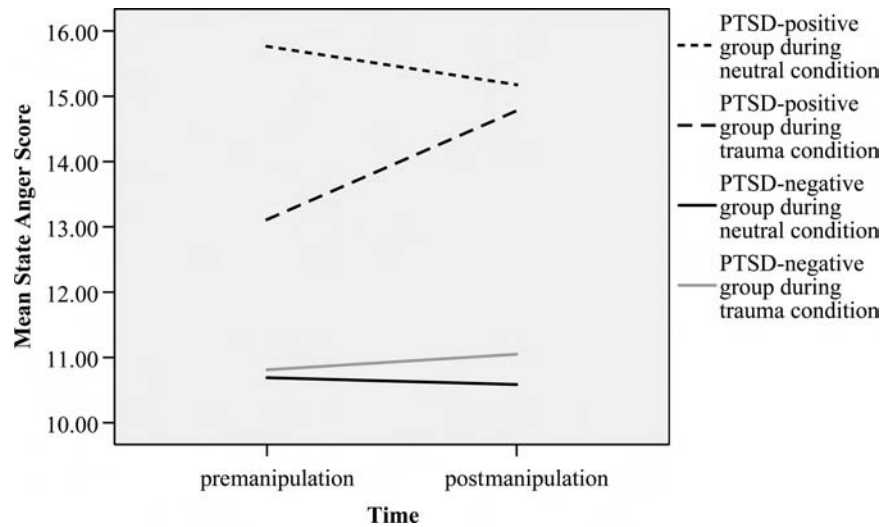


Figure 1. State anger group means for the posttraumatic stress disorder (PTSD)-positive and PTSD-negative State-Trait Anger Expression Inventory (Spielberger, 1988) during pre- and postmanipulation neutral and trauma prime conditions.

$r = .60$, $p < .001$, for state anger and anxiety scores measured premanipulation on the first experimental day; see Table 2), we examined group differences while simultaneously including post-trauma prime state anger and anxiety scores in a multivariate analysis of covariance (MANCOVA), using pre-trauma prime state anger and anxiety scores as covariates. Results indicate that the PTSD-positive group had higher post-trauma prime state anger than the PTSD-negative group, $F(1, 55) = 5.68$, $p < .05$, $r = .31$, and the groups did not differ in post-trauma prime anxiety, $F(1, 55) = 1.39$, ns , $r = .16$.

Mediational Analyses

Table 2 displays the bivariate relationships among the primary study variables. PTSD symptoms were positively associated with both physical assault (medium effect size) and psychological aggression (large effect size). Consistent with the requirements for mediation, PTSD symptoms were also positively associated with the STAXI Trait Anger scale and with the State Anger scale and the anger reactivity

(calculated as preprime state anger scores subtracted from postprime state anger scores) measure obtained during trauma memory activation (i.e., during the trauma prime condition). All of these effect sizes fell within the large range of magnitude. Further, the STAXI Trait Anger scale was positively associated with both forms of relationship abuse, with a medium effect size for physical assault and a large effect size for psychological aggression. Contrary to expectations, the state anger and anger reactivity measures obtained during trauma memory activation were not associated with the abuse measures, although the relationship between postprime state anger and psychological aggression was marginally significant ($p = .08$).

The initial criteria for mediation were met for two of the six potential mediational relationships. Specifically, tests of mediation examined whether trait anger accounted for the effects of PTSD symptoms on the two abuse outcomes. Because post-trauma prime state anger and anger reactivity were not significantly correlated with the outcome variables, mediational analyses were not conducted for these

Table 2
Intercorrelations Among Study Variables

Variable	1	2	3	4	5	6	7	8
1. CAPS total symptoms	—							
2. BAI State Anxiety scale (Day 1, premanipulation)	.65***	—						
3. STAXI State Anger scale (Day 1, premanipulation)	.47***	.60***	—					
4. STAXI Trait Anger scale	.63***	.64***	.63***	—				
5. STAXI State Anger scale (post-trauma prime)	.58***	.67***	.62***	.51***	—			
6. STAXI State Anger scale trauma prime reactivity	.51***	.34**	.09	.16	.59***	—		
7. CTS Physical Assault subscale	.30*	.35**	.34**	.38**	.10	.06	—	
8. CTS Psychological Aggression subscale	.52***	.55***	.38**	.53***	.26†	.12	.56***	—

Note. CAPS = Clinician-Administered Posttraumatic Stress Disorder (PTSD) Scale; BAI = Beck Anxiety Inventory; STAXI = State-Trait Anger Expression Inventory; CTS = Conflict Tactics Scale.

† $p = .08$. * $p < .05$. ** $p < .01$. *** $p < .001$.

measures of anger. PTSD symptoms were significantly associated with physical assault, $\beta(55) = .30$, $B = 0.01$, $p < .05$; psychological aggression, $\beta(54) = .52$, $B = 0.13$, $p < .001$; and trait anger, $\beta(57) = .63$, $B = 0.13$, $p < .001$. When PTSD symptoms and trait anger scores were entered together as predictors of physical assault in a regression equation, the effects of PTSD symptoms were reduced to nonsignificance, $\beta(54) = .09$, $B = 0.00$, $pr = .08$, *ns*, and the effects of trait anger remained significant, $\beta(54) = .33$, $B = 0.04$, $pr = .28$, $p < .05$. The test of the mediational path for this analysis was statistically significant, $z = 1.99$, $p < .05$. Both PTSD symptoms, $\beta(53) = .31$, $B = 0.08$, $pr = .29$, $p < .05$, and trait anger, $\beta(53) = .34$, $B = 0.41$, $pr = .31$, $p < .05$, remained associated with psychological aggression when entered together as predictors, and the test of mediation was significant, $z = 2.24$, $p < .05$. These results suggest that trait anger mediated the effects of PTSD symptoms on both forms of abuse.

Discussion

Veterans with PTSD scored higher on the STAXI State Anger scale than those without the disorder across time and experimental conditions, extending findings of studies that have used single-item mood ratings (Pitman et al., 1987) and that have relied on self-report anger measures in uncued contexts (Chemtob et al., 1994). PTSD-positive veterans also exhibited a greater increase in state anger than did PTSD-negative veterans following the trauma prime (and not following the neutral prime). In contrast, the groups did not differ in their anxiety reaction following the trauma prime, even when taking into account the overlap between state anger and anxiety scores. Further, PTSD-positive and PTSD-negative veterans evidenced a decrease in anxiety following both primes, with the greatest decrease following the neutral prime. These results build on the work of Pitman et al. (1987), who found higher endorsement rates of anger relative to other emotions following trauma cue exposure. Taken together with findings of associations between PTSD symptoms and state anger and anger reactivity during trauma memory activation, these results support information processing models suggesting that veterans with PTSD respond to potential threats in their environment with a heightened anger response (Chemtob, Novaco, Hamada, Gross, & Smith, 1997).

Several previous studies have documented associations between variables reflecting PTSD symptomatology and the perpetration of relationship abuse among samples of military veterans (Byrne & Riggs, 1996; Jordan et al., 1992). Similarly, this study found significant relationships between PTSD symptoms and both physical and psychological abuse perpetration. The data strongly indicate that heightened PTSD symptoms not only represent a problem for the veterans but may also place the families of these individuals at risk for a range of serious physical and psychological health problems that often accompany abuse (Campbell, 2002).

Study findings also suggest a potential mechanism for the association between PTSD symptoms and relationship abuse. Higher levels of PTSD symptoms were strongly associated with higher levels of trait anger, as well as with

state anger and anger reactivity following a trauma cue. Trait anger was also associated with physical assault and psychological aggression in the hypothesized direction, a result that is consistent with a number of studies from civilian samples that have shown the salience of anger for abuse perpetration among men (Norlander & Eckhardt, 2005). Further, analyses indicated that trait anger mediated the effects of PTSD symptoms on physical assault and psychological aggression perpetration. That is, trait anger appears to represent a pathway through which PTSD symptoms lead to abusive behavior.

Counter to expectations, neither of the trauma-cued anger measures (i.e., post-trauma prime state anger or state anger reactivity during the trauma prime condition) were significantly associated with abuse. These results appear to run counter to the notion that trauma cued anger represents a particular threat for relationship abuse perpetration. Rather, results suggest that more dispositional and pervasive anger problems that tend to be highly correlated with PTSD pose a particular risk for abuse. This is consistent with prior research findings that have shown a relatively weak relationship between episodes of state anger and aggressive behavior and findings that those higher in trait anger are more likely to respond to angry affect with aggressive behavior (see Norlander & Eckhardt, 2005). Further, veterans experiencing higher levels of trait anger may be particularly likely to enter into the "survival mode" across a number of situations, resulting in an increased likelihood for engaging in abusive behavior in a relationship.

Results indicate a need for the development of interventions for abuse perpetration among PTSD-positive veterans. Given the apparent strength of the association between PTSD symptoms and abuse, PTSD-focused interventions may be particularly effective for this population. As Murphy and Eckhardt (2005) have discussed, cognitive processing therapy (CPT; Resick & Schnicke, 1992) techniques may be particularly useful for abusers with significant trauma histories, given the emphasis of CPT on targeting faulty cognitive processes and core beliefs that may underlie abusive behavior. The data further suggest that standard anger management approaches may lead to reductions in abuse among these individuals, and some prior research indicates that anger can be effectively treated among veterans with PTSD (Chemtob, Novaco, Hamada, & Gross, 1997). Several unmeasured potential mediators may also represent important treatment targets. Some recently elucidated potential mechanisms include depressive symptomatology, substance use problems, and relationship problems (Byrne & Riggs, 1996; Taft et al., 2005), and models for violence among veterans with PTSD have also emphasized neurobiological risk factors (Beckham, Moore, & Reynolds, 2000). Investigations examining a diversity of risk factors are needed to more fully understand the complex relationship between PTSD symptoms and abuse perpetration and to facilitate innovation with respect to intervention for abusive veterans with PTSD.

In the current study, we applied standard manipulations used in the study of PTSD (Keane et al., 1998; Litz et al., 2000). Further, manipulation checks indicated a relatively large increase in traumatic memories and emotions on ex-

posure to the trauma prime, and PTSD symptoms were positively correlated with trauma cue reactivity. However, the similar levels of anger reported across conditions and the lack of an increase in anxiety on exposure to the trauma prime calls into question the effectiveness of these priming procedures to cue specific emotions. Alternatively, the STAXI and BAI may not be particularly sensitive to the type of emotional changes elicited by the trauma cue. Further, these measures are correlated, thus strong conclusions regarding comparisons across these measures need to be tempered.

Participants were a small self-selected convenience sample in which there were an unequal number of PTSD-positive and PTSD-negative participants, and inclusion of those with subthreshold PTSD may have obscured group differences on the variables of interest. Further, the degree to which findings can be generalized to veterans and soldiers from cohorts who differ on important demographic and stressor exposure variables is unknown. Current evidence suggests that relationship abuse represents a problem among both active duty servicemen and veterans across cohorts and conflicts (Marshall, Panuzio, & Taft, 2005). However, the study of the role of PTSD in this regard has been limited almost exclusively to Vietnam veterans. Additional research is needed to replicate current study findings among veterans from other cohorts. Study findings should also be replicated among female veterans given that women now constitute 15.0% of all active duty personnel and often serve in key combat-support positions (Women's Research & Education Institute, 2003).

A number of other limitations warrant note. The cross-sectional nature of this study limits conclusions regarding the directionality of some of the associations obtained. For example, it is possible that trait anger is causally related to both PTSD symptoms and partner abuse, rather than mediating the relationship between PTSD symptoms and abuse. Reliance on self-report, questionnaire-based measures also represents a limitation. Finally, to explicitly examine the mechanisms responsible for the obtained associations and their potential sequence in time, future work should incorporate laboratory-based procedures designed to invoke anger and assess maladaptive cognitive and affective processes that occur during anger arousal and in dyadic interactions (Eckhardt et al., 1998; Jacobson et al., 1994).

Despite these limitations, this study is among the first to indicate specificity in the emotional response to trauma cues among PTSD-positive veterans and to show that trait anger may help account for the impact of PTSD symptoms on partner abuse. In light of evidence indicating that PTSD symptomatology is strongly associated with relationship abuse and considering the large number of partnered male and female military personnel currently at risk for trauma exposure and PTSD (Hoge et al., 2004), research is urgently needed to inform intervention efforts for veterans who perpetrate abuse. It is hoped that this study will assist in focusing increased attention on PTSD, anger, and relationship abuse among this population and in stimulating additional work in this area of inquiry.

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Received September 26, 2005

Revision received March 2, 2006

Accepted March 13, 2006 ■